# ANASIEZE IKENNA – CLOUD & AI ENGINEER

## Project: Real Time Oilfield Sensor Data Streaming into BigQuery

### Overview

This project demonstrates how I designed and deployed a real time oilfield data streaming pipeline on Google Cloud. The system ingests live sensor data from wells and production facilities, processes it continuously, and stores it in BigQuery for immediate querying and analysis.

Rather than relying on batch uploads or manual reporting, this architecture supports continuous field telemetry, making it suitable for digital oilfield use cases such as production monitoring, equipment health tracking, and operational analytics.

### Problem Statement

A newly formed development team supporting oil and gas operations needed a solution to:

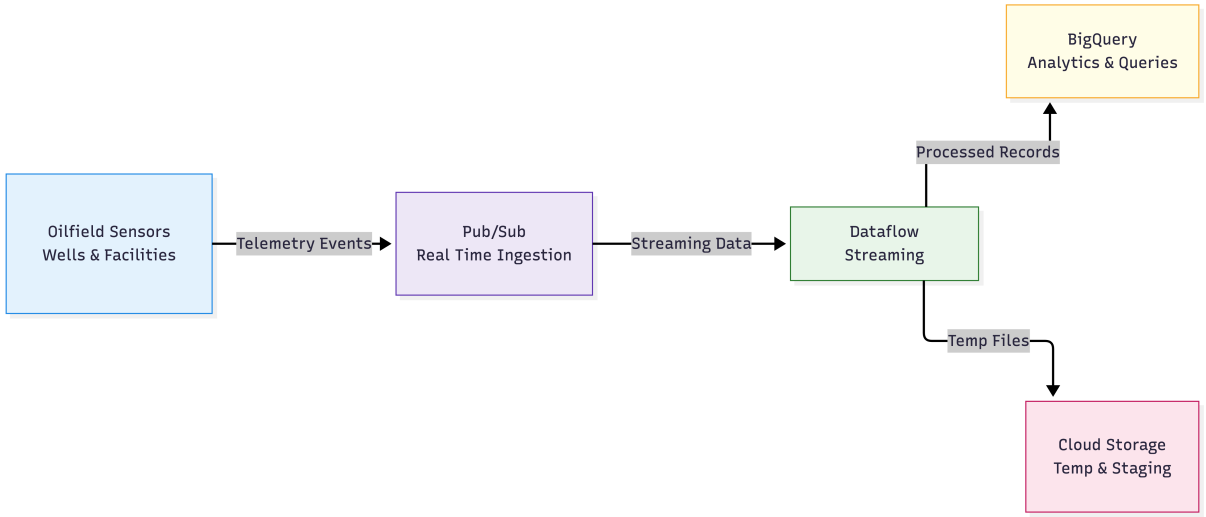
- Ingest real time temperature data from oilfield sensors
- Process continuous streaming data reliably at scale
- Store telemetry in an analytics ready data warehouse
- Validate incoming field data as it arrives

**Goal**: Responsible for designing and implementing the end to end oilfield telemetry streaming pipeline using Google Cloud managed services.

### Tech Stack

- Cloud Storage – temporary and staging storage for Dataflow job execution
- Pub/Sub – real time ingestion of oilfield sensor telemetry
- Dataflow – continuous stream processing of field data
- BigQuery – analytics storage for querying and validation

### Architecture Overview



**Flow of Data**

1. Oilfield sensors at wells and production facilities publish telemetry events
2. Pub/Sub ingests sensor messages in real time
3. Dataflow processes the telemetry stream continuously
4. BigQuery stores processed records for analytics and reporting
5. SQL queries are used to validate data and analyze field conditions

This architecture is serverless, scalable, and aligned with modern digital oilfield platforms.

**Deployment Steps**

+ **Provisioned Cloud Storage for Dataflow execution job**

+ **Created a BigQuery dataset and table for streaming ingestion**

+ **Configured Pub/Sub for real time oilfield sensor data ingestion**

+ **Deployed a Dataflow streaming pipeline from Pub/Sub to BigQuery**

+ **Published telemetry events and validated live ingestion using BigQuery queries**



Each component was created in the correct region with required APIs enabled to reflect production best practices.

**Outcome**

+ A fully operational real time oilfield telemetry streaming pipeline
+ Live sensor data flowing continuously from Pub/Sub into BigQuery
+ A reproducible, cloud native analytics architecture suitable for oil and gas operations

This project shows that I can design, deploy, and operate real time oilfield data pipelines, troubleshoot distributed cloud systems independently, and think end to end like a cloud engineer supporting energy and production environments.